



## Overview

### Points To Remember About Spinal Stenosis

- Spinal stenosis occurs when the spine is narrowed in one or more areas. This puts pressure on the spinal cord and nerves to cause pain.
- The impact of the disease varies from person to person.
- Spinal stenosis may be treated by medications, braces, or surgery.
- Your doctor may also recommend that you limit your activity and exercise. Talk to your doctor before starting an exercise program.

Spinal stenosis is a narrowing of spaces in the spine (backbone) that results in pressure on the spinal cord and/or nerve roots. This disorder involves the narrowing of one or more of three areas of the spine:

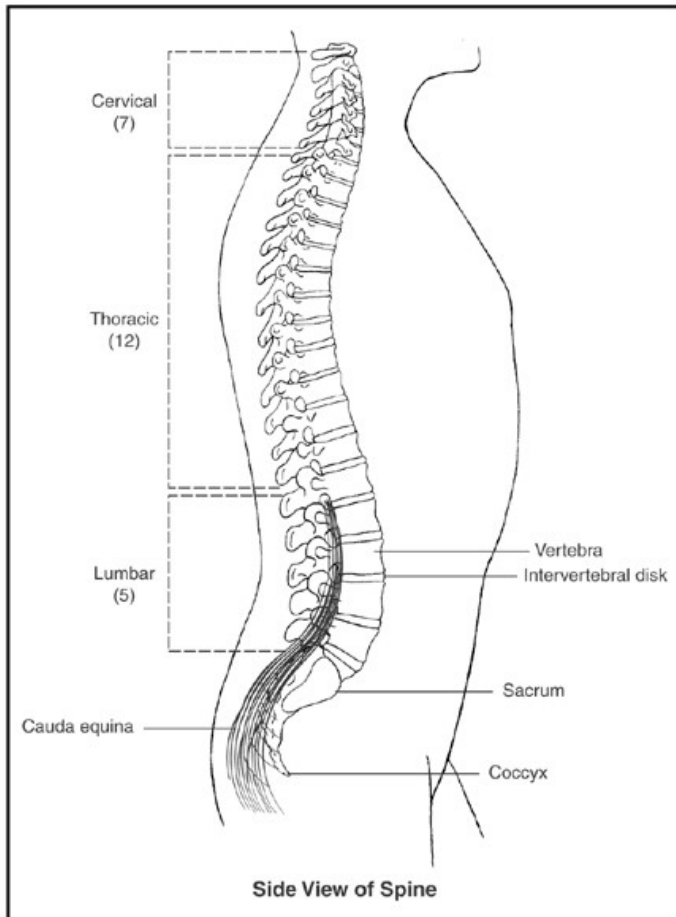
- The canal in the center of the column of bones (vertebral or spinal column) through which the spinal cord and nerve roots run.
- The canals at the base or roots of nerves branching out from the spinal cord.
- The openings between vertebrae (bones of the spine) through which nerves leave the spine and go to other parts of the body.

The spine is a column of 26 bones that extend in a line from the base of the skull to the pelvis (see fig. 1).

Twenty-four of the bones are vertebrae. The bones of the spine include:

-

**Figure 1**



- Twelve thoracic vertebrae at the back wall of the chest.
- Five lumbar vertebrae at the inward curve (small) of the lower back.
- The sacrum, composed of five fused vertebrae between the hip bones.
- The coccyx, composed of three to five fused bones at the lower tip of the vertebral column.

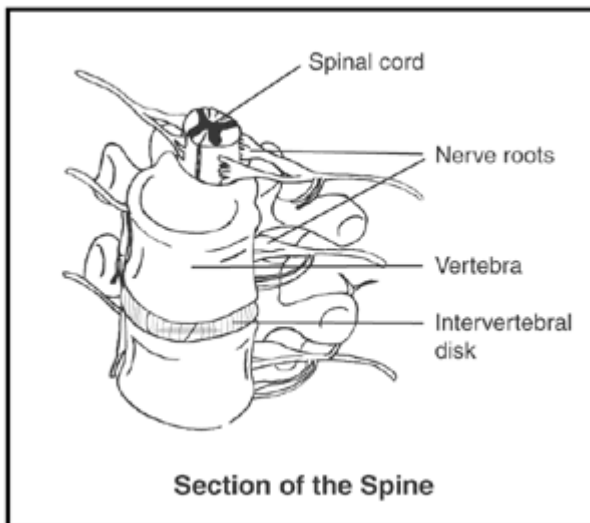
The vertebrae link to each other and have shock-absorbing intervertebral disks that lie between them to cushion them.

The vertebral column provides the main support for the upper body, allowing you to stand upright or bend and twist. It also protects the spinal cord from injury.

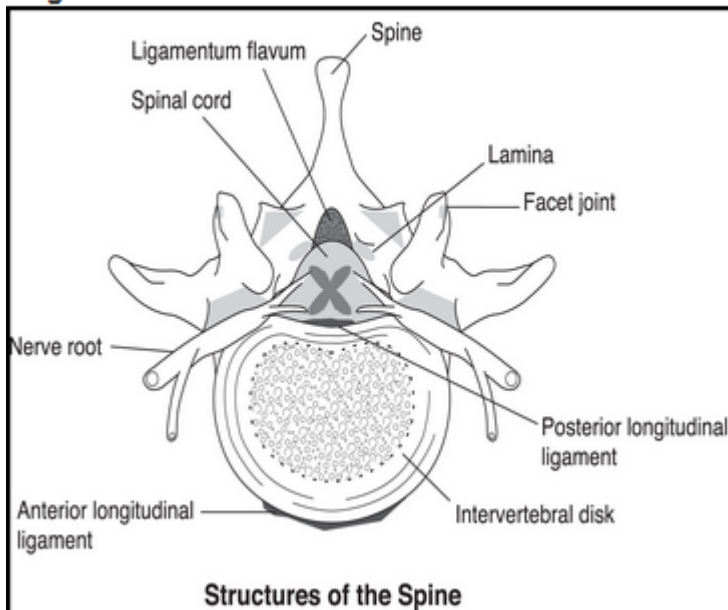
### **What structures of the spine are involved in stenosis?**

The following structures of the spine are the ones most involved in spinal stenosis (see figs.1, 2, 3, and 7):

**Figure 3**



**Figure 2**



**Facet joints.** Joints located on the

back of the main part of the vertebra. They are formed by a portion of one vertebra and the vertebra above it. They connect the vertebrae to each other and permit backward motion.

- **Ligaments.** Elastic bands of tissue that support the spine by preventing the vertebrae from slipping out of line as the spine moves.
- **Spinal cord/nerve roots.** A major part of the central nervous system that extends from the base of the brain down to the lower back and that is encased by the vertebral column. It consists of nerve cells and bundles of nerves. The cord connects the brain to all parts of the body via 31 pairs of nerves that branch out from the cord and leave the spine between vertebrae.
- **Synovium.** A thin membrane that produces fluid to lubricate the facet joints, allowing them to move easily.
- **Vertebral arch.** A circle of bone around the canal through which the spinal cord passes. It is composed of a floor at the back of the vertebra, walls (the pedicles), and a ceiling where

two laminae join.

- **Cauda equina.** A sack of nerve roots that continues from the lumbar region, where the spinal cord ends, and continues down to provide neurologic function to the lower part of the body. It resembles a “horse’s tail” (*cauda equina* in Latin).

## Who gets it?

This disorder is most common in men and women over 50 years of age. However, it may occur in younger people who are born with a narrowing of the spinal canal or who suffer an injury to the spine.

## Symptoms

The space within the spinal canal may narrow without producing any symptoms. The neck or back may or may not hurt.

However, if narrowing places pressure on the spinal cord, cauda equina, or nerve roots, there may be a slow onset and progression of symptoms. In the arms and legs, people may have:

- Numbness.
- Weakness.
- Cramping, or general pain.
- Pain radiating down the leg (sciatica).

Sitting or flexing the lower back should relieve symptoms. The flexed position "opens up" the spinal column, enlarging the spaces between vertebrae at the back of the spine. Flexing exercises are often advised, along with stretching and strengthening exercises.

People with more severe stenosis, such as with cauda equine syndrome, may have problems with:

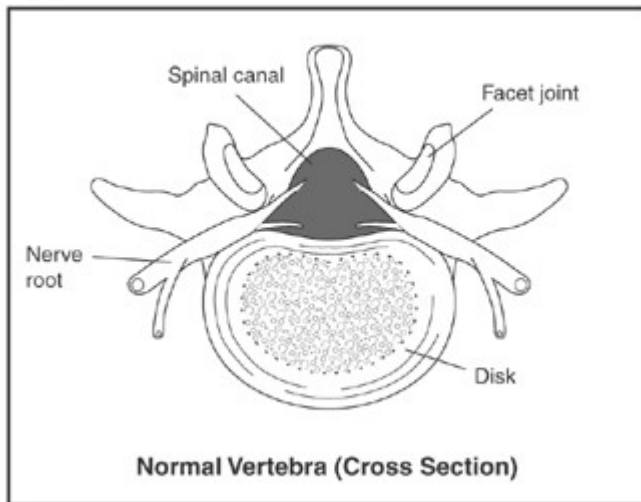
- Bowel function.
- Bladder function.
- Sexual function.
- Pain, weakness, or loss of feeling in one or both legs.
- Foot disorders.

## Causes

The normal vertebral canal (see fig. 4) provides enough room for the spinal cord and cauda

equina. Narrowing of the canal, which occurs in spinal stenosis, may be inherited or acquired.

**Figure 4**



## Inherited Conditions

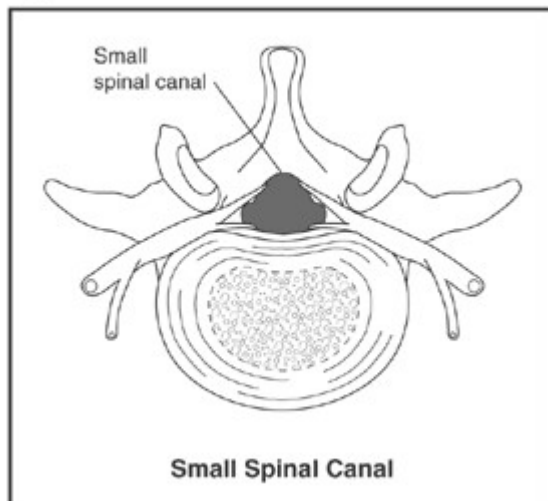
Some people inherit a small spinal canal (see fig. 5) or have a curvature of the spine (scoliosis) that produces pressure on nerves and soft tissue and compresses or stretches ligaments.

In an inherited condition called achondroplasia, defective bone formation results in changes that reduce the diameter (distance across) of the spinal canal.

## Aging

Spinal stenosis most often results from a gradual, degenerative aging process.

**Figure 5**



Either structural changes or inflammation can begin the

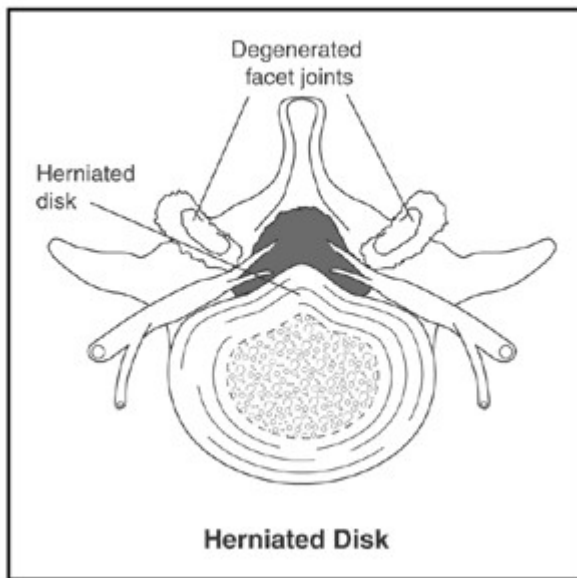
process. As people age, the ligaments of the spine may thicken and calcify (harden from deposits of calcium salts). Bones and joints may also enlarge. When surfaces of the bone begin to project out from the body, these projections are called osteophytes (bone spurs).

When the health of one part of the spine fails, it usually places increased stress on other parts of the spine. For example, a herniated (bulging) disk may place pressure on the spinal cord or

nerve root (see fig. 6).

When a segment of the spine becomes too mobile, the capsules (enclosing membranes) of the facet joints thicken in an effort to stabilize the segment, and bone spurs may occur. This decreases the space available for nerve roots leaving the spinal cord.

**Figure 6**



Spondylolisthesis, a condition in which one vertebra slips forward on another, may result from a degenerative condition or an accident, or, very rarely, may be present at birth. Poor alignment of the spinal column when a vertebra slips forward onto the one below it can place pressure on the spinal cord or nerve roots at that place.

## Arthritis

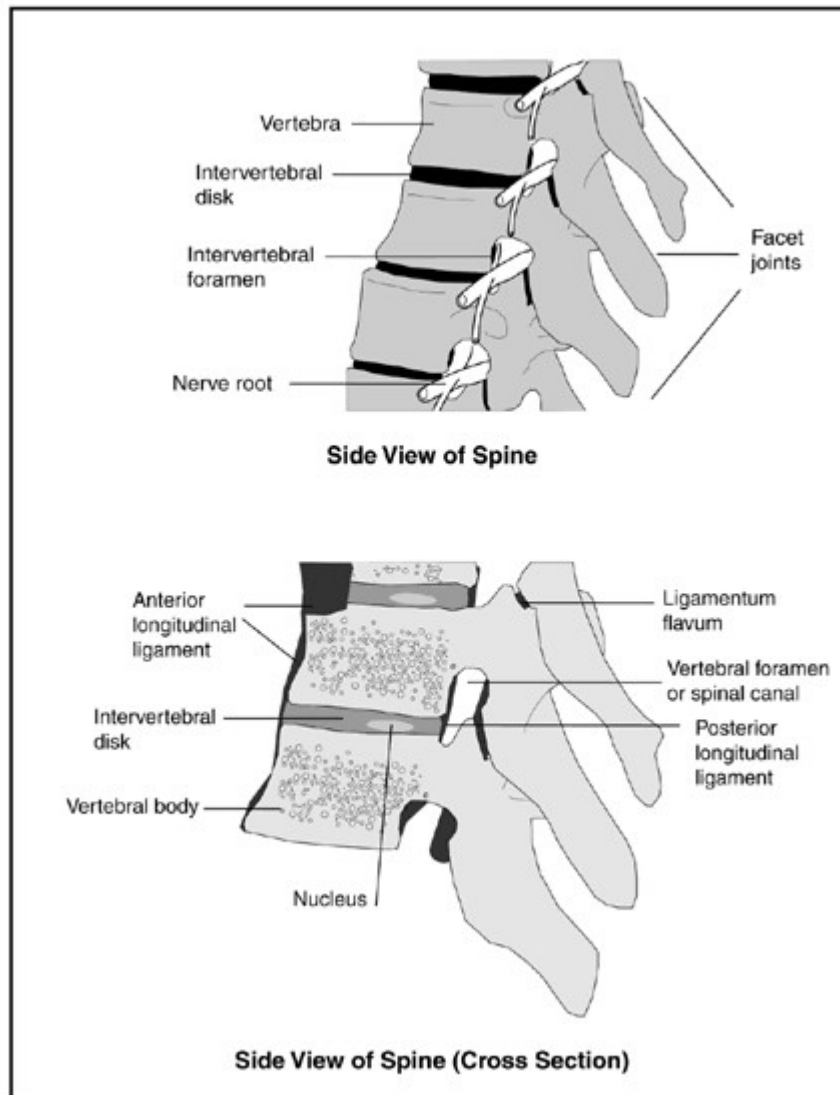
Aging, along with arthritis, is the most common cause of spinal stenosis. Two forms of arthritis that may affect the spine are osteoarthritis and rheumatoid arthritis.

- **Osteoarthritis.** Osteoarthritis is the most common form of arthritis and is more likely to occur in middle-aged and older people. It is a chronic, degenerative process that may involve multiple joints of the body. It wears away the surface cartilage layer of joints, and is often accompanied by overgrowth of bone, formation of bone spurs, and impaired function. If the degenerative process of osteoarthritis affects the facet joint(s) and the disk, the condition is sometimes referred to as spondylosis. With this condition, a person may have disk degeneration and an enlargement or overgrowth of bone that narrows the central and nerve root canals.
- **Rheumatoid Arthritis.** Rheumatoid arthritis usually affects people at an earlier age than osteoarthritis does and causes inflammation and enlargement of the soft tissues (the synovium) of the joints. Although not a common cause of spinal stenosis, damage to ligaments, bones, and joints that begins as synovitis (inflammation of the synovial membrane that lines the inside of the joint) has a severe and disrupting effect on joint function. The portions of the vertebral column with the greatest mobility (for example, the neck area) are often the ones most affected in people with rheumatoid arthritis.

## Other Acquired Conditions

The following conditions that are not related to aging or degenerative disease are causes of

**Figure 7**



acquired spinal stenosis:

- **Tumors of the spine** are abnormal growths of soft tissue that may affect the spinal canal directly by inflammation or by growth of tissue into the canal. Tissue growth may lead to bone resorption (bone loss due to overactivity of certain bone cells) or displacement of bone.
- **Trauma**(accidents) may either dislocate the spine and the spinal canal or cause burst fractures that produce fragments of bone that penetrate the canal.
- **Paget's disease of bone** is a chronic (long-term) disorder that typically results in enlarged and abnormal bones. Excessive bone breakdown and formation cause thick and fragile bone. As a result, bone pain, arthritis, noticeable bone structure changes, and fractures can occur. The disease can affect any bone of the body, but is often found in the spine. The blood supply that feeds healthy nerve tissue may be diverted to the area of involved bone. Also, structural problems of the involved vertebrae can cause narrowing of the spinal canal, producing a variety of neurological symptoms. Other developmental

conditions may also result in spinal stenosis.

- **Ossification of the posterior longitudinal ligament** occurs when calcium deposits form on the ligament that runs up and down behind the spine and inside the spinal canal (see fig. 7). These deposits turn the fibrous tissue of the ligament into bone. (Ossification means "forming bone.") These deposits may press on the nerves in the spinal canal.

## Diagnosis

A doctor may use a variety of approaches to diagnose spinal stenosis and rule out other conditions.

- **Medical history.** You tell your doctor details about symptoms and about any injury, condition, or general health problem that might be causing the symptoms.
- **Physical examination.** The doctor (1) examines you to determine the extent of limitation of movement, (2) checks for pain or symptoms when you hyper-extend the spine (bend backwards), and (3) checks for normal neurologic function (for instance, sensation, muscle strength, and reflexes) in the arms and legs.
- **X-ray.** An x-ray beam is passed through the back to produce a two-dimensional picture. An x-ray may be done before other tests to look for signs of an injury, tumor, or inherited problem. This test can show the structure of the vertebrae and the outlines of joints, and can detect calcification.
- **MRI (magnetic resonance imaging).** Energy from a powerful magnet (rather than x-rays) produces signals that are detected by a scanner and analyzed by computer. This produces a series of cross-sectional images ("slices") and/or a three-dimensional view of parts of the back. An MRI is particularly sensitive for detecting damage or disease of soft tissues, such as the disks between vertebrae or ligaments. It shows the spinal cord, nerve roots, and surrounding spaces, as well as enlargement, degeneration, or tumors.
- **Computerized axial tomography (CAT).** X-rays are passed through the back at different angles, detected by a scanner, and analyzed by a computer. This produces a series of cross-sectional images and/or three-dimensional views of the parts of the back. The scan shows the shape and size of the spinal canal, its contents, and structures surrounding it.
- **Myelogram.** A liquid dye that x-rays cannot penetrate is injected into the spinal column. The dye circulates around the spinal cord and spinal nerves, which appear as white objects against bone on an x-ray film. A myelogram can show pressure on the spinal cord or nerves from herniated disks, bone spurs, or tumors.

## Treatment

Treatment of spinal stenosis may consist of nonsurgical treatments, alternative therapies, and surgery.

### Nonsurgical Treatments



In the absence of severe or progressive nerve involvement, a doctor may prescribe one or more of the following conservative treatments:

- Nonsteroidal anti-inflammatory drugs (NSAIDs), such as aspirin, naproxen, ibuprofen, or indomethacin, to reduce inflammation and relieve pain. The longer a person uses NSAIDs, the more likely he or she is to have side effects, ranging from mild to serious. Side effects of NSAIDs include stomach problems; skin rashes; high blood pressure; fluid retention; and liver, kidney, and heart problems. Many other drugs cannot be taken when a patient is being treated with NSAIDs, because NSAIDs alter the way the body uses or eliminates these other drugs. Check with your health care provider or pharmacist before you take NSAIDs. NSAIDs should only be used at the lowest dose possible for the shortest time needed.
- Analgesics, such as acetaminophen, to relieve pain.
- Corticosteroid injections into the outermost of the membranes covering the spinal cord and nerve roots to reduce inflammation and treat acute pain that radiates to the hips or down a leg.
- Anesthetic injections, known as nerve blocks, near the affected nerve to temporarily relieve pain.
- Restricted activity (varies depending on extent of nerve involvement).
- Prescribed exercises and/or physical therapy to maintain motion of the spine, strengthen abdominal and back muscles, and build endurance, all of which help stabilize the spine. You may be encouraged to try slowly progressive aerobic activity such as swimming or using exercise bicycles.
- A lumbar brace or corset to provide some support and help you regain mobility. This approach is sometimes used for people with weak abdominal muscles or older patients with degeneration at several levels of the spine.

## Alternative Therapies

Alternative (or complementary) therapies are diverse medical and health care systems, practices, and products that are not presently considered to be part of conventional medicine. Some examples of these therapies that can treat spinal stenosis include:

- **Chiropractic treatment.** This treatment is based on the philosophy that restricted movement in the spine reduces proper function and may cause pain. Chiropractors may manipulate (adjust) the spine to restore normal spinal movement. They may also employ traction, a pulling force, to help increase space between the vertebrae and reduce pressure on affected nerves. Some people report that they benefit from chiropractic care. Research thus far has shown that chiropractic treatment is about as effective as conventional, nonsurgical treatments for acute back pain.
- **Acupuncture.** This treatment involves stimulating certain places on the skin by a variety of techniques, in most cases by manipulating thin, solid, metallic needles that penetrate the skin. Research has shown that low back pain is one area in which acupuncture has benefited some people.

More research is needed before the effectiveness of these or other possible alternative therapies can be definitively stated. Health care providers may suggest these therapies in

addition to more conventional treatments.

## **Surgery**

In many cases, the conditions causing spinal stenosis cannot be permanently altered by nonsurgical treatment, even though these measures may relieve pain for a period of time. To find out how much nonsurgical treatment will help, a doctor may recommend such treatment first. However, surgery might be considered right away if you have numbness or weakness that interferes with walking, impaired bowel or bladder function, or other neurological involvement.

The decision to have surgery depends on:

- The effectiveness of nonsurgical treatments.
- The extent of your pain.
- Other diseases that you may have.
- Your physical condition.
- Your preferences.

The purpose of surgery is to:

- Relieve pressure on the spinal cord or nerves.
- Restore and maintain alignment and strength of the spine.

This can be done by removing, trimming, or adjusting diseased parts that are causing the pressure or loss of alignment.

The most common surgery is called decompressive laminectomy: removal of the lamina (roof) of one or more vertebrae to create more space for the nerves. A surgeon may perform a laminectomy with or without fusing vertebrae or removing part of a disk. He or she may use various devices to enhance fusion and strengthen unstable segments of the spine.

If you have spinal stenosis caused by spinal trauma or achondroplasia, you may need surgery at a young age. When a person with achondroplasia needs surgery, laminectomy (removal of the roof) without fusion is usually effective.

### ***Major Risks of Surgery***

All surgery, particularly that involving general anesthesia and older patients, carries risks. The most common complications of surgery for spinal stenosis are:

- A tear in the membrane covering the spinal cord at the site of the operation.
- Infection.
- A blood clot that forms in the veins.

These conditions can be treated but may prolong recovery.

### ***Long-Term Outcomes of Surgical Treatment***

Removal of the obstruction that has caused the symptoms usually gives a person some relief;

most people have less leg pain and are able to walk better after surgery. However, if nerves were badly damaged before surgery, there may be some remaining pain or numbness or no improvement. Also, the degenerative process will likely continue, and pain or limitation of activity may reappear after surgery.

## Who treats it?

Doctors who can provide nonsurgical treatment of spinal stenosis may be:

- Internists.
- General practitioners.
- Rheumatologists, who treat arthritis and related disorders.
- Neurologists, who treat nerve diseases.
- Orthopaedic surgeons.
- Neurosurgeons.

Orthopaedic surgeons and neurosurgeons also perform spinal surgery if you need it. Allied health professionals such as physical therapists may also help treat patients.

## Research Progress

The National Institutes of Health (NIH) and other federal agencies are supporting several research projects related to spinal stenosis. For example:

- NIAMS-supported researchers have published results from the Spine Patient Outcomes Research Trial (SPORT), the largest trial to date comparing surgical and nonsurgical interventions for the treatment of low back and associated leg pain caused by spinal stenosis. The study found that for people with spinal stenosis, surgical treatment was more effective than nonsurgical treatment in relieving symptoms and improving function. However, the functional status of people who received nonsurgical therapies also improved somewhat during the study.
- Continued follow-up of participants in the SPORT trial will assess long-term outcomes and the cost effectiveness of surgical or nonsurgical management of spinal stenosis and other back problems.
- SPORT researchers are also developing web-based tools that allow patients with low back disorders to apply the best clinical evidence to their individual circumstances and make more informed treatment choices about back surgery. A strong collaboration of researchers will develop, validate, and evaluate novel methods for disseminating individualized risk and benefit information.
- Researchers are investigating the safety and value of new technologies for the surgical treatment of back problems.
- Other studies are focused on nonsurgical approaches for dealing with back pain, including a web-based program that provides worksite employees with a multidisciplinary

intervention for the self-treatment of back pain.

- Researchers are working to identify optimal approaches for the prevention and early treatment of the many underlying causes of spinal stenosis, including osteoarthritis, rheumatoid arthritis, and Paget's disease.

## Related Resources

### **U.S. Food and Drug Administration**

Toll free: 888-INFO-FDA (888-463-6332)

Website: <https://www.fda.gov>

Drugs@FDA at <https://www.accessdata.fda.gov/scripts/cder/daf>. Drugs@FDA is a searchable catalog of FDA-approved drug products.

### **Centers for Disease Control and Prevention, National Center for Health Statistics**

Website: <https://www.cdc.gov/nchs/>

### **National Institute of Neurological Disorders and Stroke, National Institutes of Health**

Website: <https://www.ninds.nih.gov>

### **American Academy of Orthopaedic Surgeons**

Website: <https://www.aaos.org>

### **American College of Rheumatology**

Website: <https://www.rheumatology.org>

### **North American Spine Society**

Website: <https://www.spine.org>

### **Spondylitis Association of America**

Website: <https://www.spondylitis.org>

### **Arthritis Foundation**

Website: <https://www.arthritis.org>

If you need more information about available resources in your language or other languages, please visit our webpages below or contact the NIAMS Information Clearinghouse at

[NIAMSInfo@mail.nih.gov](mailto:NIAMSInfo@mail.nih.gov).

- [Asian Language Health Information](#)
- [Spanish Language Health Information](#)

### **Join a Clinical Trial**

[Find a Clinical Trial](#)

## **View/Download/Order Publications**

[Spinal Stenosis, Easy-to-Read Fast Facts](#)

[Spinal Stenosis, Questions and Answers](#)

[Back Pain, Handout on Health](#)

[Back Pain, Easy-to-Read Fast Facts](#)